SECTION 16525

EXTERIOR LIGHTING SYSTEM

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NOTE: Edit this Section to match project requirements.
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PART 1 GENERAL

1.1 SECTION INCLUDES

Furnish and install the following:

1. Exterior lighting fixtures and accessories.
2. Poles and accessories.
3. Concrete foundations.
4. Lamps.
5. Ballasts.

1.2 DEFINITIONS:

A. Fixture: A fixture is a complete lighting unit including lamp(s) and parts required to distribute the light, position and protect the lamp(s), and connect the lamp(s) to the power supply.

B. Lighting Unit: A fixture,or an assembly of fixtures with a common support, including a pole or bracket with mounting and support accessories.

C. Luminaire: The same as "fixture".

D. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under specified ambient conditions.

E. Listed/Labelled: As defined in ANSI/NFPA 70 *National Electrical Code*.

1.3 SUBMITTALS

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NOTE: Edit 1.3 to match project requirements.
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A. Submit the following in accordance with the requirements of Sections 01300 and 01700.

B. Catalog Data: Submit catalog data describing lighting fixtures, lamps and ballasts. Include data substantiating that materials comply with specified requirements. Arrange data for fixtures in the order of fixture designation.

C. Performance Curves/Data: Submit photometric data for each type of lighting fixture.

D. Shop Drawings: Submit manufacturer's shop drawings for non-standard fixtures.

E. Maintenance Data: Submit maintenance instructions for inclusion in the operating and maintenance manuals.

1.4 ENVIRONMENTAL REQUIREMENTS

Provide lighting fixtures, lamps and ballasts, suitable for operation at an altitude of 7500 feet above sea level.

1.5 EXTRA MATERIALS

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NOTE: Edit paragraph 1.5 to match project requirements.

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Furnish the following extra materials matching products installed. Package with protective covering for storage and identify with labels describing contents.

1. Fluorescent Lamps: Provide 5 percent of quantity of lamps of each type, but no less than two lamps of each type.

2. Incandescent Lamps: Provide 10 percent of quantity of lamps of each type, but not less than two lamps of each type.

3. High Intensity Discharge (HID) Lamps: Provide 5 percent of quantity of lamps of each type, but no less than two lamps of each type.

4. Lenses, Diffusers, Covers, Globes and Guards: Provide 1 percent of quantity of each type, but not less than one of each type.

5. Ballasts: Provide 1 percent of quantity of ballasts of each type, but not less than one of each type.

6. Photoelectric Relays: Provide 5 percent of quantity of photoelectric relays of each type, but no less than two of each type.

1.6 QUALITY ASSURANCE

A. Comply with ANSI/NFPA 70 *National Electrical Code* for components and installation.

B. Provide fixtures that are UL listed and labelled for their indicated use and location on this project.

C. Use manufacturers that are experienced in manufacturing fixtures, lamps and ballasts that are similar to those indicated for this Project and have a record of successful in-service performance.

1.7 STORAGE AND HANDLING OF POLES

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NOTE: Edit 1.7 to match project requirements.

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A. Store poles on decay-resistant treated skids at least 1 foot above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Wood Poles: Do not drag treated wood poles along the ground. Do not handle with tongs, hooks or other pointed tools. Do not apply tools to ground line section of poles.

C. Keep factory applied wrappings on metal poles until immediately before pole installation. Handle poles with web fabric straps.

PART 2 PRODUCTS

2.1 EXTERIOR FIXTURES

A. Furnish exterior lighting fixtures that comply with requirements specified below and the lighting fixture schedule on the Drawings.

B. Furnish metal parts free from burrs and sharp corners and edges.

C. Furnish sheet metal components fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.

D. Furnish metal parts finished with manufacturer's standard finish unless otherwise indicated on the Drawings. Reject fixtures with finish having runs, streaks, stains, holidays and defects. Replace fixtures showing evidence of corrosion during warranty period. Provide stainless steel exposed hardware.

E. Provide doors and frames that are smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position. Door shall be removable for cleaning or replacing lens.

F. Provide fixtures with minimum reflecting surface reflectance as follows unless scheduled otherwise:

1. White Surfaces: 85 percent

2. Specular Surfaces: 83 percent

3. Diffusing Specular Surfaces: 75 percent

G. Provide lenses, diffusers, covers and globes as scheduled on the Drawings. Provide materials that are resistant to yellowing and other changes due to aging, exposure to heat and ultraviolet radiation.

H. Provide resilient gaskets in doors that are heat-resistant and aging-resistant to seal and cushion lens and refractor.

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NOTE: Edit the following five paragraphs to match project requirements.

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I. Provide fluorescent fixtures that conform to UL 1570 - *Fluorescent Lighting Fixtures*.

J. Provide high intensity discharge (HID) fixtures that conform to UL 1572 - *High Intensity Discharge Lighting Fixtures*.

K. Provide incandescent fixtures that conform to UL 1571 - *Incandescent Lighting Fixtures*.

L. Provide fixtures for hazardous locations that conform to UL 844 - *Electric Lighting Fixtures for Use in Hazardous (classified) Locations*.

M. Provide photoelectric relays for fixtures as scheduled on the Drawings. Provide photoelectric relays that conform to UL 733 - *Plug-in, Locking Type Photocontrols for Use With Area Lighting*. Relay contacts shall be arranged to fail in the "on" position and factory set to turn fixture on at 1.5 to 3 footcandles and off at 4.5 to 10 footcandles.

2.2 LAMPS

A. Furnish lamps that comply with requirements specified below and the lighting fixture schedule on the Drawings.

B. Furnish lamps that conform to ANSI Standards, C78 series applicable to each type of lamp.

C. Manufacturers: General Electric, North American Phillips, Sylvania

2.3 FLUORESCENT LAMP BALLASTS

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NOTE: Edit 2.3 to match project requirements.

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A. Provide fluorescent ballasts that comply with requirements specified below and the lighting fixture schedule on the Drawings.

1. Conform to UL 935 - *Fluorescent Lamp Ballasts*, listed for use in outdoor fixtures.

2. Certified by Electrical Testing Laboratory (ETL), and labelled by Certified Ballast Manufacturer's Association (CBM).

3. High power factor, at least 0.90.

4. Sound rated "A" or "B".

5. Rated for starting at -20°C.

B. Manufacturers: Advance, MagneTek, Valmont

2.4 HIGH INTENSITY DISCHARGE LAMP BALLASTS

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NOTE: Edit 2.4 to match project requirements.

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A. Provide high intensity discharge ballasts that comply with requirements specified below for lamps specified in this Section and the lighting fixture schedule on the Drawings.

1. Conform to UL 1029 - *High-Intensity-Discharge Lamp Ballasts* and ANSI C82.4 - *Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps*.

2. Constant wattage autotransformer (CWA) or regulator, high-power-factor type.

3. Minimum starting temperature of -30°C.

4. Normal ambient operating temperature 40°C.

5. Open circuit operation will not reduce normal ballast life.

6. Provide high pressure sodium (HPS) ballasts that incorporate a solid-state ignitor/starter with an average life in the pulsing mode of 4,000 hours at an ignitor/starter case temperature of 90°C.

7. When scheduled on the Drawings, provide high pressure sodium ballasts for 150 watt and smaller lamps with an instant restrike starter that will generate a multiple pulse to restrike lamp arc after a momentary power interruption.

B. Manufacturers: Advance, MagneTek

2.5 POLES AND ACCESSORIES

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NOTE: Edit 2.5 to match project requirements.
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A. Furnish poles and accessories that comply with requirements specified below and the lighting fixture schedule on the Drawings.

B. Conform to AASHTO LTS-1 - *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

C. Provide pole, base and anchorage rated to carry the fixtures, supports, and appurtenances at the indicated height above grade without deflection or whipping in an 80 mph wind with 1.3 gust factor.

D. Provide mountings, fastenings and other appurtenances fabricated from corrosion-resistant materials that are compatible with poles and fixtures and will not cause galvanic action at contact points. Provide mountings that will correctly position luminaires to provide scheduled light distribution.

E. Provide a welded 1/2 inch grounding lug in each metal pole, accessible through the handhole.

F. Provide metal poles with anchor type bases and galvanized steel anchor bolts, leveling nuts and bolt covers.

G. Provide steel poles that are fabricated from tubing conforming to ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psi. Poles shall be one-piece construction up to 40 feet in length. Poles over 40 feet in length may be in two sections with an overlapping joint. Provide reinforced access handhole in wall. Provide poles with galvanized finish.

H. Provide tapered aluminum poles that are fabricated from 5052-H34 alloy and conform to ASTM 13209. Provide reinforced access handhole in wall. Provide poles with finish as scheduled on the Drawings.

I. Provide straight aluminum poles that are fabricated from 6063-T6 alloy and conform to ASTM B 429 - *Standard Specification of Aluminum-Alloy Extruded Structural Pipe and Tube*. Provide reinforced access handhole in wall. Provide poles with finish as scheduled on the Drawings.

J. Provide pressure treated wood poles that conform to ANSI Standard O5.1. Treatment material shall be copper naphthenate. Treatment shall conform to AWPA C4 - *Poles, Preservative Treatment, Pressure Processed* for the wood species used. Bore, roof and gain poles before treatment.

K. Provide steel mast arms that are fabricated from 2 inch pipe, continuously welded to pole attachment plate and have span and rise as indicated on the Drawings. Provide with galvanized finish.

L. Provide aluminum mast arms that are tapered oval tubing, continuously welded to pole attachment plate and have span and rise as indicated on the Drawings. Provide with same finish as pole.

M. Provide metal pole brackets that are designed to match pole metal and finish. Provide cantilever brackets without underbrace, in the sizes and styles indicated on the Drawings, with straight tubular end section to accommodate the fixture.

N. Provide wood pole brackets that conform to ANSI C136.13 - *Roadway Lighting Metal Brackets for Wood Poles*.

O. Provide pole-top tenons that are fabricated to support the fixture indicated and are securely fastened to the pole top.

PART 3 EXECUTION

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NOTE: Edit Part 3 to match project requirements.
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3.1 INSTALLATION

A. Install fixtures in accordance with manufacturer's instructions and approved shop drawings.

B. Locations of fixtures shown on the Drawings are diagrammatic. Coordinate fixture locations with building finishes, building structure, utility piping, security fences, and existing trees. Obtain approval for location changes through Contract Administrator.

C. Set fixtures plumb, square, level and secure.

D. Install surface mounted fixtures directly to an outlet box which is supported from structure.

E. Install lamps in fixtures in accordance with manufacturer's instructions.

3.2 CONCRETE FOUNDATIONS

A. Construct concrete foundations with 4000 psi, 28 day concrete and reinforcing conforming to Division 3 Section "Cast-In-Place Concrete". Comply with details on the Drawings and manufacturer's recommendations for foundation dimensions, reinforcing, anchor bolts, nuts and washers.

B. In addition to power conduits, install a 1 inch PVC conduit in the pole base for the ground lead described below.

C. Cure concrete foundations for 7 full curing days before erecting poles.

3.3 POLE ERECTION

A. Set embedded poles to depth indicated on the Drawings, but not less than 1/6 of pole length below finish grade. Auger holes large enough to permit the use of tampers the full depth of the hole. Backfill in 6 inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of the undisturbed earth.

B. Use fabric web slings to raise and set poles.

C. Tighten anchor bolt nuts and other pole hardware to torque recommended by manufacturer.

D. After pole is levelled, pack non-shrink grout between anchor base and concrete foundation to provide a full bearing surface.

3.4 GROUNDING

A. Use methods and materials specified in Section 16450.

B. Install a 10 foot long, 5/8 inch diameter copper clad driven ground rod at each pole.

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NOTE: Edit paragraph C to match project requirements.
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C. Connect ground lug of metal pole to ground rod using #6 copper ground conductor.

D. Ground metallic components of lighting unit with non-metallic pole to ground rod using #6 copper ground conductor.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed lighting unit for damage. Replace damaged fixtures, poles and components.

B. Test installed fixtures for proper operation. Provide instruments to make and record test results. Replace or repair malfunctioning fixtures and components then re-test. Repeat procedure until all fixtures operate properly.

C. Replace inoperative lamps.

3.6 ADJUSTING AND CLEANING

A. Clean each fixture inside and out, including plastics and glassware. Use methods and materials recommended by manufacturer.

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NOTE: Edit paragraph B to match project requirements.
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B. Aim adjustable fixtures to provide required light intensities as indicated on the Drawings or as directed by the Contract Administrator.

END OF SECTION

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<u>NOTE TO DESIGNER</u>: The lighting fixture schedule on the Drawings should contain the following information for exterior lighting:

1. **Fixture type designation (i.e. "X")**
2. **Quantity and Description of fixture (i.e. One 400 watt high pressure sodium floodlight with NEMA 6X5 type beam spread)**
3. **Description of materials (i.e. Cast aluminum housing and tempered glass lens)**
4. **Description of mounting (i.e. Adjustable knuckle type slipfitter mount)**
5. **Description of fixture finish (i.e. Grey enamel finish)**
6. **Description of ballast if applicable (i.e. 277V CWA ballast)**
7. **Description (ANSI code where applicable) and quantity of lamps (i.e. 1-S51WA-400/C lamp)**
8. **Description of accessories where applicable (Photocell in twist-lock socket)**
9. **Description of pole where applicable (i.e. 40 foot tapered round steel pole)**
10. **Description of pole finish where applicable (i.e. Galvanized finish)**

11. Manufacturer and catalog number for fixture and pole (i.e. XYZ #ABCD-1234 fixture on #LMN-98-76 pole)

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